



Printed Pages : 4

TAS-102/202

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 9928

Roll No.

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B. Tech.

(SEM. II) EXAMINATION, 2007-08

CHEMISTRY

Time : 3 Hours]

[Total Marks : 100

Note : Attempt all the questions.

1 Attempt any **four** parts of the following : 5×4

- (a) Draw the molecular orbital diagram of oxygen molecule. Explain, why oxygen molecule is paramagnetic in nature.
- (b) On the basis of band theory, differentiate between conductors, semiconductors and insulators.
- (c) Explain why
 - (1) H_2O is liquid but H_2S is a gas
 - (2) Acetone is more volatile than alcohol.
- (d) An FCC structure of an element has density **10.3 gm/cm³** and has an edge length 310 pm. Calculate the atomic mass of the element.
- (e) Derive Bragg's equation.

In Bragg's reflection of X-ray, a reflection was found at **30°** with lattice plane of spacing **1.87 Å**. If this is a second order reflection, calculate the wavelength of X-rays.

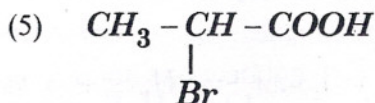
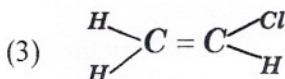
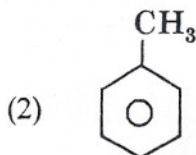
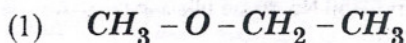
- (f) Calculate the radius ratio for trigonal bipyramidal packing of spheres in solids.



2 Attempt any **two** parts of the following :

10×2

(a) Calculate the NMR signals and splitted signals in the following molecules :



(b) Write the method of preparation for the following polymers :

(1) Nylon 6

(2) Buna-S

(3) Polyacrylonitrile.

(c) (1) Differentiate between addition and condensation polymerisation with suitable examples.

(2) Write applications of conducting polymers.



- 3 Attempt any **two** parts of the following : 10×2
- (a) Give the mechanism of the following reactions :
- (1) Hoffmann rearrangement
 - (2) Cannizzaro reaction
 - (3) Aldol condensation.
- (b) Explain the mechanism of SN^1 and SN^2 organic reactions.
- (c) (1) Differentiate between
- Enantiomers and diastereomers
 - Racemic mixtures and meso compounds.
- (2) Draw the potential energy diagram for the various conformations of *n*-butane.
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- 4 Attempt any **four** parts of the following : 5×4
- (1) Give the application of phase rule to water system.
 - (2) Prove that for a second order reaction, the half life period is inversely proportional to its initial concentration.
 - (3) Calculate the energy of activation whose rate constant is tripled by 10°C rise in temperature in the vicinity of 27°C .
 - (4) Explain hydrogen evolution and oxygen absorption theory for electrochemical corrosion.
 - (5) Explain sacrificial anodic and impressed cathodic protection method for prevention of corrosion.



- (6) Calculate the standard EMF of the following at 25°C, writing its half cell reaction and net cell reaction $Zn | ZnSO_4 || CuSO_4 | Cu$

Standard potentials of Cu and Zn electrodes are +0.34 and -0.76 volt respectively

5 Attempt any **four** parts of the following : 5×4

- (1) Explain zeolite method for softening of hard water.

- (2) A water sample contains the following impurities : $Ca^{2+} = 20 \text{ ppm}$,

$$Mg^{2+} = 18 \text{ ppm}, HCO_3^- = 183 \text{ ppm}$$

and $SO_4^{2-} = 24 \text{ ppm}$. Calculate the lime and soda needed for softening

$$(Ca = 40, Mg = 24).$$

- (3) Explain the construction and working of Bomb calorimeter.

- (4) A gas has the following composition by volume : $H_2 = 32\%$, $CH_4 = 14\%$,

$N_2 = 40\%$, $O_2 = 14\%$. If 25% excess air is used, find the weight of air actually needed for combustion of this gas.

- (5) Discuss the harmful effects of NO_2 in air.

- (6) Write short note on formation and depletion of ozone in atmosphere.

